

Texas Tech University Department of Physics
CRN 43132 Astronomy 1401H Stars and Galaxies
Course Information Spring, 2011

Lectures: 3.00-3.50 pm MWF, Science 00010. You will need to attend regularly, since much of the material that I cover in class is not in your text, and because we will be doing small group exercises in class which count towards your class participation grade.

Text: *The Cosmic Perspective: Stars, Galaxies and Cosmology (6th Ed.)* by Bennett, Donahue, Schneider, and Voit. Published by Addison Wesley. The “Starry Night” software is **not** required.

Instructor: Assistant Professor Maurice Clark. Office: Sc 014 Phone: 806-742-3781
 Email: maurice.clark@ttu.edu

Office Hours: Thursday 10:00-11:00. Friday 4.00-5.00 PM. These are the times when I will be available in my office for discussions on any problems you might be having with the course. You are also welcome to come up to my office at any other time, although I cannot guarantee to be available.

Grading:	<u>Assignments</u>	7 x 2%	14%.	(A failing grade on the assignment component is a failing grade in the course.)
	<u>Labs</u>	9 x 3%	27%	(A failing grade on the lab component is a failing grade in the course.)
	<u>Observing labs:</u>	2 x 4%	8%	
	<u>Course Participation:</u>		7%	
	<u>Mid-term Tests:</u>	3 x 7%	21 %	
	<u>Comprehensive final</u>		23%	(Just what the name implies)

Grades: The following are the grades to be awarded for this course and the *approximate* scores for which they will be awarded.

- A Has met the course objectives with distinction. 85% +
- B Has met the course objective with credit 73% - 84%
- C Has met the course objectives. 60% - 72%
- D Has met some of the course objectives. 50% - 59%
- F Has failed to meet the course objectives. 49% or less.

For Better or For Worse: By Lynn Johnston



Course Format: We will be covering the course material in lecture/discussion format on Mondays, Wednesdays and Fridays. For the discussion part of the class, you will have been given certain readings to do and questions to prepare for. **It is extremely important that you come prepared for the discussion!** Be sure to let me know if I mention something you are unfamiliar with and help me adjust the pace of the course to better suit your needs. During the course we will be studying worlds far different to our own. From the huge to the tiny, from the densest to the most tenuous, from the hottest to the coldest, even things that cannot be seen. In studying these, we will use tools from many other branches of science, particularly physics and chemistry. Some mathematical skills are necessary as is a vivid imagination! By the end of the course I hope you leave with a deeper appreciation of the awesome universe that we are a part of and can understand why some people devote their lives to spending every possible moment, often in extremely isolated locations, regardless of temperature, to study its wonders.

What should you get from this course? To a large extent that will depend on you and how much work you are prepared to put in. At the very least there are four major points that I would hope you will gain from the course.

1. To better understand the solar system and the amazing variety of objects that comprise it.
2. To learn to *think skeptically*, and to realize that science is more about searching for understanding than it is about knowing "The Truth".
3. To gain confidence in your abilities to learn something about which you knew little or nothing before attending this class.
4. To explore the ideas you are learning, both qualitatively (looking at the "Big Picture") and quantitatively (with math and numbers).

Course Purpose:

This course will satisfy a four hour laboratory science requirement. It has no pre-requisites. It serves well the student that is interested in astronomy and the student who is not science oriented but needs to satisfy the science requirement. This course is very important to both groups of students. For those interested (or who inadvertently become interested), it will give you the tools to continue astronomy as a lifelong interest. For those not really interested, astronomy will give you a basic understanding of science which is need for all educated members of society because the population at large determines the role of science in society — not just the scientists!

Expected Learning Outcomes:

Upon completion of this course, students will:

1. Gain a cosmic perspective.
2. Understand astronomy basics (For example: What is a star? A galaxy? Why are nebulae pink? ...)
3. Know the history of astronomy.
4. Understand the physics of astronomy at an elementary level and know how astronomers use it to learn about the universe.
5. Understand how telescopes work.
6. Understand how stars are formed, produce their energy and eventually die.
7. Understand the current, most widely accepted theories of the origin and fate of the universe.
8. Understand why some galaxies are extremely active and some are quiet.
9. Understand the various methods astronomers use to derive the distances to celestial objects.
10. Have the tools needed to continuing enjoying astronomy on their own as a hobby if desired, including using a simple telescope to make observations of and identify celestial objects.

The objective of the study of the natural sciences component of a core curriculum is to enable the student to understand, construct, and evaluate relationships in the natural sciences, and to enable the student to understand the bases for building and testing theories. The natural sciences investigate the phenomena of the physical world.

Students graduating from Texas Tech University should be able to: explain some of the major concepts in the Natural Sciences and to demonstrate an understanding of scientific approaches to problem solving, including ethics.

Homework Assignments:

(a) There will be 7 homework assignments. These will be handed out in class on a Monday and will be due on the following Monday. These will be graded and each will contribute a possible total of 2 points towards your final grade. The questions will include problem solving and basic maths. **Note that a failing grade on the homework component is a failing grade in the course.**

(b) Make sure to show all your work and to explain what you are doing. You will receive very little credit if you do not. **Staple** your assignment together to make sure I do not lose any parts of it, and leave space in the margins for comments.

(c) You may work together on assignments and discuss them with others, but this does not mean that you may copy someone else's work. The paper that you hand in should be the result of **your own** work, with ideas expressed in your own words and with your own calculations shown. **Violations of this policy are taken very seriously.** Here is an example of the difference: - asking “Does Kepler’s third law apply in this situation?” is an acceptable question. However asking “Did you get 5.6 metres as the answer for question 6 when you plugged in 5 for x and 0.6 for y in the equation $(x + y)$?” is **NOT** acceptable. Throughout the semester, I hope you take the opportunity to talk to your fellow ASTRO 1400 students about the material you are learning, and how to apply it during exams and homework assignments—sometimes the best way to learn something is to hear it more than one way, or to try and explain it to someone else! However, please remember that in the end, your answers and all of your work must be your own. Indeed, you’ll want to make sure that you understand the material yourself, for when you walk into the lecture hall to take your exam, you will have no one to help you but yourself!

So remember to learn the material yourself, and don’t take credit for something someone else told you. **This also includes copying answers from the book!** Your assignment answers **must** show evidence of being **your own work**. Please remember the following, which is part of the Standard Texas Tech Policies that apply to all of your classes:

Students will foster a spirit of academic integrity, and they will not present work as their own that was not honestly performed by them. For a complete description of this policy see Texas Tech Operating Policy 34.12.

My general policy is that if a student is found to have copied from someone else’s assignment, **BOTH** persons get zero for that assignment, on the first occurrence. A second offence will result in a **fail grade** for the course. If two or more students hand in assignments that are basically the same and then claim that they worked together on the assignment, then the marks for the assignment will be split between the students.

(d) You have **ONE** late assignment slip at the end of this information, which entitles you to a 48-hour extension. If you are handing in a late assignment, you should attach this slip to your assignment and hand it to me **at the start of class** on the following Wednesday! As this is the **only** extension you will be granted for the course, **use it wisely!** Assignments are always due in class **before** it begins; **if you come**

to class a little late, hand in the assignment immediately after class so that you do not disrupt the class by walking in front.

Daytime Labs: There is a **required** laboratory that is part of this course. You will receive one grade for the lecture and laboratory combined—they are not separate courses. Each lab will contribute 3 points towards your final grade. For most weeks during the semester you will have a lab during your regularly scheduled lab session. These will be held in Sc 121. If no lab is listed on your schedule, you should see me immediately. You **must attend** the labs in order to get credit (points) for them and all lab work must be turned in to your TA **by you** at the conclusion of each lab. **Work done on your own outside of lab will not be accepted. YOU MUST PASS THE LAB SECTION IN ORDER TO PASS THIS COURSE; REGARDLESS OF YOUR GRADE IN THE COURSE. LESS THAN 50% for the combined lab/observing lab component IS AN AUTOMATIC FAIL IN Astronomy 1401.**

Night-time Observing sessions: Observing is an important part of astronomy and as such, is an important part of this course. These are **in addition** to your weekly lab meetings in Sc121 and will be held at the Texas Tech Observatory. All necessary information regarding these activities will be posted on the web site <http://www.phys.ttu.edu/~gwen/index.htm> or given out in the labs.

Tests: They will emphasize concepts and, to a lesser degree, calculations. You should carefully review your class notes and assignments, as well as the relevant sections of the textbook, before the exam. You may **not** share calculators. Each test will contribute a possible total of 7 points towards your final grade. **No tests may be dropped. There will be no make-up for missed tests after one day from the time the test is given.** If possible please let me know early if you are going to miss a test since there is a possibility that you may take the test in advance.

Final Exam: The final exam will cover the entire course and will be held during the normal exam time. However the final will be **optional** for students who have an “A” or “B” grade at the end of the course. Students with a “C” grade or below **must** take the final.

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office in 335 West Hall or 806-742-2405.

One last very important point! The showing of pictures and slides is a considerable component of the course. This requires the room lights to be set down low! This can cause some students to feel drowsy. If this happens you can lose much of what is being presented. While I will be trying to watch out for this, you should also take responsibility for staying awake. Remember, this is **YOUR** course, and what you learn from it will depend largely on you.

LATE ASSIGNMENT SLIP

This slip entitles the bearer to one 48 hour extension to an assignment for Astro 1401.

Attach this slip to the assignment and bring it to Professor Clark.

CRN 43132 Astronomy 1401H Stars and Galaxies
Course Syllabus

Here is a **tentative** outline of the lecture topics for the term and the associated readings from the textbook. Some modifications may be made depending on how fast we proceed.

	<u>Date</u>	<u>Topic</u>	<u>Weekly Readings</u>	<u>Weekly Assignment</u>	<u>Labs</u>
Week 1	W Jan 12 F Jan 14	Introduction. The scale of the Universe. Ancient Astronomy Constellations, Sky motions.	<i>The Cosmic Perspective:</i> Chpt 1 Appendix A. Appendix B. Appendix C. <i>The Cosmic Perspective:</i> Chpt 2.1. Appendix I.		No indoor lab this week
Week 2	M Jan 17 W Jan 19 F Jan 21	University Holiday Sky Coordinates. Early Theories. Kepler's laws. Newton: Gravity: Orbits.	<i>The Cosmic Perspective:</i> Chpt S1 <i>The Cosmic Perspective:</i> Chpt 3 <i>The Cosmic Perspective:</i> Chpt 4.2 – 4.5	Assignment 1 Due Monday Jan 24	No indoor lab this week
Week 3	M Jan 24 W Jan 26 F Jan 28	Light, Radiation, Atoms I Light, Radiation, Atoms II Spectroscopy Doppler effect	<i>The Cosmic Perspective:</i> Chpt 5.1 – 5.3 <i>The Cosmic Perspective:</i> Chpt 5.4 - 5.5		Lab 1 Motions in the Sky First observing Lab
Week 4	M Jan 31 W Feb 2 F Feb 4	Telescopes I Telescopes II The Sun - Structure	<i>The Cosmic Perspective:</i> Chpt 6 <i>The Cosmic Perspective:</i> Chpt 14	Assignment 2 Due Monday Feb 7	Lab 2 Extending the Scale First observing Lab
Week 5	M Feb 7 W Feb 9 F Feb 11	The Sun – Structure First mid-term test: The Sun – Energy Production.	<i>The Cosmic Perspective:</i> Chpt 14		Lab 3 Spectroscopy First observing Lab
Week 6	M Feb 14 W Feb 16 F Feb 18	Measuring the stars I Measuring the stars II Between the stars I	<i>The Cosmic Perspective:</i> Chpt 15 <i>The Cosmic Perspective:</i> Chpt 16.1	Assignment 3 Due Monday Feb 21	Lab 4 Lifetime of the Sun
Week 7	M Feb 21 W Feb 23 F Feb 25	Between the stars II Life cycle of a one solar mass star I Life cycle of a one solar mass star II	<i>The Cosmic Perspective:</i> Chpt 16.1 <i>The Cosmic Perspective:</i> Chpt 16.2 – 16.3 <i>The Cosmic Perspective:</i> Chpt 17.1 - 17.2 <i>The Cosmic Perspective:</i> Chpt 18.1		Lab 5 Classification of Stellar Spectra First observing Lab
Week 8	M Feb 28 W Mar 2 F Mar 4	Life cycle of a medium mass star. Binary star evolution Life cycle of a high mass star.	<i>The Cosmic Perspective:</i> Chpt 17.4 <i>The Cosmic Perspective:</i> Chpt 17.3	Assignment 4 Due Monday Mar 7	Lab 6 The H-R Diagram First observing Lab

Week 9	M Mar 7 W Mar 9 F Mar 11	Exotic leftovers I Exotic leftovers II Exotic leftovers III	<i>The Cosmic Perspective:</i> Chpt 18.2 – 18.3		Lab 7 Photoelectric Photometry of the Pleiades
	Mar 12 - 20	No Classes Mid-term break			
Week 10	M Mar 21 W Mar 23 F Mar 25	The Milky Way Galaxy I Second mid-term test. The Milky Way Galaxy II	<i>The Cosmic Perspective:</i> Chpt 19 <i>The Cosmic Perspective:</i> Chpt 21.2	Assignment 5 Due Monday Mar 28	Lab 8 Ages of star Clusters
Week 11	M Mar 28 W Mar 30 F Apr 1	Other galaxies I: Classification. Other galaxies II: Distribution. When Things go Bump in the Night.	<i>The Cosmic Perspective:</i> Chpt 20.1		No indoor lab this week Second Observing Lab
Week 12	M Apr 4 W Apr 6 F Apr 8	Active Galaxies Quasars Cosmic expansion and Hubble's law.	<i>The Cosmic Perspective:</i> Chpt 21.3 <i>The Cosmic Perspective:</i> Chpt 20.3	Assignment 6 Due Monday Apr 11	Lab 9 Galaxy Classification Second Observing Lab
Week 13	M Apr 11 W Apr 13 F Apr 15	The Structure of the Universe. The Big Bang and the origin of the universe. The first 60 seconds.	<i>The Cosmic Perspective:</i> Chpt 21.1 - 21.2		Lab 10 The Age of the Universe
Week 14	M Apr 18 W Apr 20 F Apr 22	The first 60 minutes. Cosmic mysteries. The Fate of the Universe.	<i>The Cosmic Perspective:</i> Chpt 22.1 – 22.2. <i>The Cosmic Perspective:</i> Chpt 22.4	Assignment 7 Due Friday Apr 22	No indoor lab this week
Week 15	M Apr 25 W Apr 27 F Apr 29	No Classes. Third mid-term test. Strings 'n Things.	<i>The Cosmic Perspective:</i> Chpt S4		No indoor lab this week
Week 16	M May 2	Are we alone?	<i>The Cosmic Perspective:</i> Chpt 24		
Week 17	Tu May 10	Final Exam 1.30pm – 4.00pm			